The Veterinary Record

FOUNDED BY WILLIAM HUNTING, F.R.C.V.S., 1888.

No. 42. OCTOBER 19, 1940. VOL. 52.

THE VACCINATION OF GUINEA-PIGS AGAINST *BRUCELLA ABORTUS* INFECTION WITH LIVING AND HEAT-KILLED SUSPENSIONS

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It is now a well-established fact that the resistance of guinea-pigs to *Br. abortus* infection may be raised by immunisation with living cultures of reduced virulence (Huddleson, 1924; Schroeder and Cotton, 1925; McEwen and Roberts, 1936; McEwen and Priestley, 1938), whereas attempts to demonstrate a similar increase in resistance following inoculation with dead cultures have not been notably successful (Ascoli, 1916; Stafseth, 1920; Hagan, 1922; Gwatkin, 1931; McEwen and Roberts, 1936). The experiments outlined in this paper were designed to confirm and extend these observations and to see whether resistance varied appreciably with different time intervals after vaccination.

Methods

Four different strains were used, *viz.* 45, 45 (6), 45 (20) and 544. Details of these strains have been provided elsewhere (McEwen, 1940a); here it is sufficient to say that strain 45 is practically non-virulent; that strains 45 (6) and 45 (20), having been passaged through six guinea-pigs and through 20 guinea-pigs respectively, possess a low degree of virulence, and that strain 544 is fully virulent; the first three strains are aerobic, while 544 is CO_2-sensitive; it is interesting and important to note that strains 45, 45 (6) and 544 are smooth, while 45 (20) is a rough variant as judged by the heat-stability test of Pandit and Wilson (1932) and by serological tests.

All the vaccines were prepared from 48-hour liver agar cultures and standardised by opacity to tube 3 of the Brown Scale. With the exception of the mucin-containing vaccine, the organisms were suspended in sterile saline. The living vaccines were prepared as required and used on the same day. The dead vaccine was prepared from strain 544 in bulk, sterilised by autoclaving at 115° C. for 30 minutes and stored in the ice-chest. The mucin-containing vaccine was prepared by mixing equal volumes of (*a*) a saline suspension of strain 45 standardised to tube 6 of the Brown Scale and (*b*) a 5·0 per cent. solution of mucin in saline.

On each occasion that an animal was vaccinated, the dose was given subcutaneously and consisted of 1·0 c.c.

Six different methods of vaccination were tested and with each method the group of treated animals was subdivided into three further groups which were exposed to infection 28, 70 and 98 days respectively after the last dose of living vaccine. Thus, in all, 18 different procedures were tried. The lay-out of Table I will make this quite clear. It should be emphasised that the experiment was so arranged that all animals were infected on the same day; the infective doses in the various groups were therefore strictly comparable.

The methods of vaccination were as follows:—

(*a*) Two doses of strain 45 with an interval of 28 days between them.

(*b*) One dose of strain 45, followed by one dose of strain 45 (6) after an interval of 28 days.

(*c*) One dose of strain 45, followed by one dose of strain 45 (20) after an interval of 28 days.

(*d*) One dose of strain 45, followed by one dose of strain 45 in mucin after an interval of 28 days.

(*e*) Weekly inoculations of dead vaccine up to one week before the date of infection.

(*f*) Weekly inoculations of dead vaccine up to and two weeks after the date of infection.

It is advisable that some explanation for the adoption of these procedures should be given. It has been previously shown (McEwen and Priestley, 1938; McEwen, 1940b), that immunising ability is correlated with virulence; thus, strain 45 (6) gives a higher degree of protection than strain 45, and 45 (20) gives a higher degree of protection than strain 45 (6). At the same time, the greater the protective power of any strain, the greater is its persistence in the tissues. It was hoped, therefore, that a primary inoculation of strain 45, which does not persist in the tissues, would enable these tissues more quickly to rid themselves of strains of increased virulence subsequently used to raise resistance. Hence, methods of vaccination (*b*) and (*c*) were instituted; method (*a*) was really a control to show that mere repetition of inoculation was not the decisive factor. Method (*d*) was introduced to see whether persistence of a non-virulent strain in the body was sufficient to give immunity or whether that persistence had to be associated with a degree of virulence; it was considered likely that suspension in mucin would enable strain 45 to survive in the tissues a good deal longer than it would normally do in saline; we have no data showing this to be the case, but, in view of the findings of other workers with other organisms, it would seem to be likely. Methods (*e*) and (*f*) were included to test the efficacy of dead vaccines; it may be noted that some animals had relatively few doses (8) whereas others had quite a number (up to 21).

It was originally intended to kill off at intervals before infection a number of animals inoculated with the living vaccines in order to determine whether the vaccine strains were persisting in the tissues or not. Unfortunately owing to deaths from an intercurrent infection, the numbers of available animals were so reduced that this plan had to be abandoned.

One month after the last dose of living vaccine had been given, all vaccinated and a number of control animals were exposed to infection with the virulent strain 544. As may be seen from the table, the infecting doses consisted of 1 in 10^6, 1 in 10^7 and 1 in 10^8 dilutions of a saline suspension of a 48-hour growth standardised by opacity to tube 3 of the Brown Scale. Each animal received 1·0 c.c. inoculum intramuscularly.

Some six weeks after exposure to infection, all animals were killed and their spleens cultured for the presence of *Br. abortus*. These cultures were done in duplicate, one set being incubated in 10 per cent. CO_2 and one in air; in this way it was possible to determine whether the vaccine strain was surviving, since these strains would grow in air, whereas the infecting strain would only grow in CO_2.

The results are shown in the table at foot.

DISCUSSION

On the whole, the results were disappointing and not easy to interpret. Hardly a single point is unequivocally answered. Nevertheless, several tentative observations may be made.

It would seem that, of the methods tried, vaccination with strain 45 followed by strain 45 (20) is the most satisfactory and this is in accordance with previous results (McEwen and Priestley, 1938).

All the methods involving the use of living vaccine were better than those involving dead vaccine.

With the living vaccines used in these experiments, there is a suggestion that resistance drops slightly when the time elapsing between vaccination and infection is relatively great; this drop, however, is not pronounced, a finding in accordance with that of McEwen and Roberts (1936).

From only five guinea-pigs were aerobic and therefore presumably vaccine strains isolated. Three of these had been vaccinated with strain 45 (20) and two with strain 45 (6); with one exception, they were isolated from animals that had been vaccinated one month before the day of infection. From none of these animals was the infecting strain 544 isolated.

It should be noted that vaccination with dead vaccines afforded some degree of protection. With each infective dose there was 100 per cent. infection among the controls, whereas following vaccination with the autoclaved suspension this infection rate was in some instances considerably reduced.

A prolonged course of vaccination with dead vaccines was apparently no more and no less satisfactory than a relatively short course. Thus, after 21 doses, the average percentage of animals infected over all infective doses was 42·3, whereas after 11 doses it was 48.

This work was financed by a grant approved by the Agricultural Research Council.

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Table, showing the Numbers and Percentages of Animals Infected following Various Vaccination Procedures

No. Days Interval between First Dose of Vaccine and Infection.	Group.	Vaccine Inoculated.	Test Dilutions of Strain 544.		
			1 : 10^6	1 : 10^7	1 : 10^8
126	a	45 + 45	(6/10) 60·0		(3/13) 23·1
	b	45 + 45 (6)	(6/8) 75·0	(3/10) 30·0	(7/14) 50·0
	c	45 + 45 (20)	(5/11) 45·5		(2/16) 12·5
	d	45 + 45 (mucin)	(5/16) 31·3		(9/14) 28·6
	e	544 dead	(7/8) 87·5		(6/11) 54·5
	f	544 dead	(5/7) 71·4	(4/10) 40·0	(2/13) 15·4
98	a	45 + 45	(0/3) 0·0	(2/10) 20·0	(1/9) 11·1
	b	45 + 45 (6)	(1/8) 12·5	(3/12) 25·0	(3/12) 25·0
	c	45 + 45 (20)	(1/11) 9·1		(2/16) 12·5
	d	45 + 45 (mucin)	(4/12) 33·3	(1/9) 11·1	(4/14) 28·6
	e	544 dead	(6/9) 66·7	(10/14) 71·4	(6/14) 42·9
	f	544 dead	(11/13) 84·6	(7/12) 58·3	(5/12) 41·7
56	a	45 + 45	(3/11) 27·3	(1/11) 9·1	(7·15) 46·7
	b	45 + 45 (6)	(3/9) 33·3	(1/12) 8·3	(1/22) 4·5
	c	45 + 45 (20)	(1/11) 9·1	(0/9) 0·0	(0/14) 0·0
	d	45 + 45 (mucin)	(6/15) 40·0	(4/15) 26·7	(0/27) 0·0
	e	544 dead	(7/7) 100·0	(3/9) 33·3	(3/9) 33·3
	f	544 dead	(7/9) 77·8	(2/6) 33·3	(5/15) 33·3
	Control unvaccinated animals		(15/15)100·0	(14/14)100·0	(15/15)100·0

The figures in brackets show the number of animals exposed to infection (the denominator) and the number infected the numerator). The other figures show the percentage of infection.

CLINICAL COMMUNICATION

Red Clover Flowers Extract in the Treatment of Canine Cancer

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In the years 1935 and 1936 I treated three dogs, suffering from epithelioma of the skin, with extracts of red clover flowers. The extracts were given by the intramuscular route and extending over a considerable period in each case. No. 1 gave a definite response at the outset but ultimately a breakdown occurred and the animal was destroyed. Nos. 2 and 3 showed little improvement. This line of treatment I think might, however, be given a more extended, further trial.

The point of interest, to me at least, however, was the complex character of red clover, only going to show what a wonderful chemical laboratory every plant and flower in itself, is (attached is an analysis of red clover flowers by Power and Salway), a masterpiece of industry and scientific skill. I collected the clover flower heads while the sun was shining and sent them to The British Drug Houses, Ltd., to prepare an extract. They reported as follows :—

"The parcel contained 1,127 grammes and the material was extracted with 16 litres of anhydrous alcohol and later with 10 litres, filtered and evaporated at a low temperature, giving 40 grammes of a soft gummy extract. Then this extract was treated with olive oil to take out all the oil soluble principles and then the residue was treated with 25 per cent. alcohol to extract the principles not soluble in oil but soluble in dilute alcohol."

From this extract two series of 1 c.c. ampoules were prepared, one the oily and the other the alcoholic solution. The former was derived from 50 grammes of fresh flowers and the latter from 25 grammes. One ampoule of each was injected every four to five days ; these were later on doubled and then trebled. The injections seem to be well tolerated : no toxic phenomena were noted save in Case 3—a collie—where muscular tremors were observed by the owner and reported by him.

Dr. Scott's enclosure is as follows :—

Constituents of Red Clover Flowers

By FREDERICK B. POWER and ARTHUR H. SALWAY

The dried flowers were completely extracted with hot alcohol, and, after the removal of the greater portion of the alcohol the resulting extract was distilled with steam. A small amount of an essential oil was thus obtained, which possessed a rather unpleasant odour and was found to contain furfuraldehyde. The portion of the alcoholic extract which was soluble in water contained a large amount of sugar, but from it a considerable number of definite crystalline substances were isolated, several of which are new compounds. These substances may be briefly enumerated as follows : Salicylic *c* p-coumaric acids ; isorhamnetin, $C_{16}H_{12}O_7$; pratol $C_{15}H_8O_2(OH)(OCH_3)$ which is apparently a flavone derivative ; pratensol, C_1-$H_9O_2(OH)_3$; a yellow compound, $C_{16}H_{10}O_7$; a substance $C_{15}H_7O_3(OH)_3$, a substance $C_{14}H_{12}O_6$; and the new glucosides : trifolin, $C_{22}H_{22}O_{11}$, H_2O which yields on hydrolysis a yellow colouring matter, trifolitin $C_{16}H_{10}O_6$ *c* rhamnose ; isotrifolin, $C_{22}H_{22}O_{11}$ and a glucoside which on hydrolysis yields quercetin $C_{15}H_{10}O_7$.

The portion of the alcoholic extract which was insoluble in water consisted chiefly of resinous material, but from it the following definite compounds were obtained : myricyl alcohol, $C_{31}H_{63}OH$; hepatcosane $C_{27}H_{56}$ and hentriacontane, $C_{31}H_{64}$, sitosterol $C_{27}H_{46}O$(mp 135°–136° —34·60°, a new dihydric alcohol, trifolianal $C_{21}H_{34}O_2(OH)$; a mixture of fatty acids (consisting chiefly of palmitic, stearic and linolic acids) ; and a small amount of pratol $C_{16}H_{12}O_4$, the last mentioned having evidently been contained in the resin in the form of a glucoside. The dihydric alcohol trifolianol $C_{21}H_{34}O_2(OH)_2$ is homologous with ipuranol, $C_{23}H_{38}O_2(OH)_2$ and with the recently discovered citrullol $C_{23}H_{36}O_2(OH)_2$ (from colocynth, its three compounds being apparently consecutive members of a series which is represented by the general formula $CnH_{2n}—60_4$).

ANNOTATION

Rickettsial Infections

The Genus Rickettsia

Just over 30 years ago RICKETS (1909) described minute organisms occurring in ticks which had fed on cases of Rocky Mountain spotted fever, and similar organisms detectable in small numbers in the blood of infected persons and artificially infected guinea-pigs. ROCHA-LIMA (1916) found similar organisms in the intestines of lice which had fed on typhus patients, and created the genus *Rickettsia* to include organisms of these types. The organisms are described as similar morphologically to bacteria except that they are more minute, and the outlines are not sharply defined. They differ from bacteria in that they stain poorly with ordinary bacterial stains but well with giemsa, taking a reddish purple colour similar to chromatin material. They show a deeply stained central portion and a paler staining outer portion. Rocha-Lima failed to obtain cultures of the organisms, but it has since been shown that they grow readily in media containing living cells.

They are essentially intracellular parasites, though in the invertebrate host they may escape from the cells and appear free in the lumen of the gut. ROCHA-LIMA was uncertain whether they were bacteria or protozoa, and that question is still unsettled.

Classification of Human Rickettsial Diseases

It is usual to divide the human infections into groups according to the epidemiological, clinical, pathological and immunological characters, and MURGATROYD (1940) recognises five such groups.

1. TYPHUS GROUP.—This includes classical, exanthematic, typhus transmitted by lice from man to man, and murine typhus transmitted by fleas from rats to man. Considerable cross immunity occurs between members of this group, and agglutinins are produced against *B. proteus* OX19 and OX2, but not against the OXK strain. The murine infection is pathogenic to rats, and causes a scrotal reaction in guinea-pigs, whilst the human strain does not.

2. SPOTTED FEVER GROUP.—This group includes Rocky Mountain spotted fever and boutonneuse fever, the organisms being transmitted to man by ticks from various reservoir hosts, sheep and dogs being incriminated in spotted fever, and dogs in boutonneuse fever. These infections only give rise to inconstant, low titre agglutinins to strains of *B. proteus*. They produce scrotal lesions in guinea-pigs.

3. TSUTSUGAMUSHI GROUP.—This consists of river fever of Japan and scrub typhus of Malaya. Infections are transmitted by mites, various rodents acting as

reservoirs. Agglutinins are produced against *B. proteus* OXK, but not against other strains. Fever and scrotal reactions are produced in guinea-pigs.

4. Trench Fever Group.—Includes trench fever and certain recurrent fevers of Poland, Russia, France, Spain and Japan. Infections of this group are transmitted by lice from man to man. The susceptibility of laboratory animals is uncertain but not marked.

5. Other Rickettsial Diseases.—Q fever of Australia and trachoma which it is noted is not universally accepted as due to a rickettsia. These infections do not produce agglutinins to *B. proteus* strains, and do not cause scrotal reactions in guinea-pigs.

Some authorities would confine the genus *Rickettsia* to organisms transmitted by invertebrates and it has been suggested that they are essentially parasites of invertebrates to which they have become adapted so that they are no longer pathogenic, whilst their invasion of the vertebrate has been more recent, the adaptation being therefore less complete (Huff, 1938). One species, however, *R. rocha-limae*, causes severe epidemics in lice and is non-pathogenic to its vertebrate host, and *R. prowazeki*, the rickettsia of typhus, is also pathogenic to its invertebrate transmittor. The carrier of Q fever has not been determined, but it is accepted as a rickettsia because it gives cross-immunity against a strain of rickettsia isolated from ticks in Montana. Trachoma is excluded by some as it appears to have no invertebrate vector, and for the same reason psittacosis is excluded and usually classed as a virus disease though the elementary bodies resemble rickettsiae in their morphological, tinctorial and cultural characters. It is true that Bedson (1932, 1934) described a cycle of development, with the formation of homogenous initial bodies and large forms in psittacosis, but Donatien and Lestoquard (1938) claim that a similar cycle occurs in boutonneuse fever, and in all the animal rickettsial diseases.

Animal Rickettsioses

In the human infections the first recognition of the nature of the disease has usually been the finding of rickettsiae in the invertebrate host, followed by the finding of the organisms in guinea-pigs or mice inoculated with infected human material. Although rickettsiae have been detected in a large number of ectoparasites of stock (Cowdry, 1923) no association has been established between such infections and animal disease, and it has been assumed that such organisms are purely parasites of the invertebrates or at any rate are non-pathogenic to the vertebrate concerned. That the latter condition may occur is shown by the symptomless infection of dogs with boutonneuse fever, and of sheep with Rocky Mountain fever.

The only rickettsial infection of stock which had received any attention till the last few years has been heartwater which does not appear to be immunologically related to any of the human groups. It does not produce agglutinins to any of the strains of *B. proteus* and though inoculable to guinea-pigs (Balozet, 1938) does not cause a scrotal reaction.

Recently tick-transmitted rickettsiae invading the monocytes of dogs, cattle and sheep have been described under the names of *R. canis*, *R. bovis* and *R. ovina* (Donatien and Lestoquard, 1937) and the first two though not inoculable to guinea-pigs will infect monkeys. A somewhat similar organism is associated with tick-borne fever of Scottish sheep. *R. conjunctivae* affecting sheep and cattle does appear to be closely related to the organism causing human trachoma, and may be identical with it.

Immunity

In man it is claimed that " recovery is accompanied by the acquisition of considerable immunity to reinfection, second attacks being rare or mild " (Murgatroyd, 1940). Other workers, however, such as Parrot (1937) suggest that immunity is dependent on the host remaining a carrier.

In animals immunity has only been studied in the case of heartwater and here it has been shown that infection can be demonstrated up to 105 days after recovery, and that the immunity conferred by one attack will not prevent a second one which may be severe if a heterologous strain of the organism is involved. The same appears to be true of psittacosis and contagious conjunctivitis (Donatien and Lestoquard, 1939).

Immunization

Attempts at immunization in man can be divided into two groups : those which employ living rickettsiae and those employing killed organisms. The milder murine strain has formed the basis of living vaccines for human typhus and has been used treated with sodium phosphate and egg yolk (Laigret, 1939) or treated with bile (Blanc and Baltazard, 1940). At first infected tissues of guinea-pig were used for the bile vaccine, but this proved unstable, and the dried faeces of rat fleas were substituted as a source of infective material.

Probably the most successful killed vaccine for typhus has been the formalized intestinal contents of lice injected with rickettsiae *per rectum* (Weigl, 1933), but 100 lice are necessary for the immunization of one individual, and the process of infecting them is tedious and requires considerable skill. Formolized cultures have also been used, the cultivation being carried out by incubating chick or mouse embryo tissue on agar slopes (Zinsser *et al.*, 1939) and vaccination with this material is said to cause the production of agglutinins to *B. proteus* OX19. Recently a rich source of infective material has become available by the discovery that if typhus rickettsiae are injected into the nostrils of half-grown mice an intense pneumonia is produced (Castaneda, 1939) the lungs providing intensely rich cultures of rickettsiae. By differential centrifugation of the pneumonic lungs the rickettsiae may be largely freed from lung tissue (Durand and Giroud, 1940). In vaccinated guinea-pigs a positive agglutination reaction develops and anti-rickettsial immune bodies are said to appear in the serum.

Good results have been claimed for the living vaccines when dealing with native populations, but they are said to be too dangerous for the immunization of Europeans. Again good results have been claimed for killed vaccines used on the population of an infected area, but in Europeans it is doubtful if they give sufficient protection. It seems possible that the good results claimed in indigenous peoples are due to a large proportion of persons in an endemic area acquiring immunity from mild or symptomless infections.

In the case of heartwater an attenuated strain of *R. ruminantium* can be obtained by syringe passage from vertebrate to vertebrate, but such a strain does not give sufficient immunity to protect against natural infection.

Chemotherapy

No drug has been discovered that has any specific value in the treatment of rickettsial infections though recently Carmichael (1940), has claimed to have had good results in the treatment of *R. canis* with "soluseptasin."

Neitz (1940) found that neosalvarsan appeared to stimulate the multiplication of *R. ruminantium* in endothelial cells, possibly by depressing the reticulo-endothelial system.

U. F. Richardson.

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THE VITAMIN L COMPLEX

"About two years ago Nakahara *et al.* claimed to have shown that two factors not hitherto recognised were necessary for the lactation of young rats. Factor L1 only was found in beef-liver extract and factor L2 only in yeast. It has lately been suggested that this vitamin L complex is identical with the 'liver filtrate factor' shown by Morgan and Simms to be necessary for the lactation of young rats, or with the factor W (filtrate factor) of Sure. Nakahara *et al.* do not agree, on the grounds (*a*) that their vitamin-L-deficient diet did in fact contain the filtrate factor in the polished rice powder constituent (the diet, when extracted with alcohol, resulted in sub-normal growth); and (*b*) that vitamin L is really a complex of two substances of which one only is found in liver filtrate and the other one only in yeast. There is a good deal of evidence that both liver filtrate and yeast filtrate contain at least two factors necessary for the growth of the rat. The two factors of the one source are probably identical with the two factors of the other. Whether vitamin L1 or L2 is identical with either of these or with still other substances in 'filtrates' will probably only be settled when each has been obtained in a pure form."—*British Medical Journal* (Aug. 10th, 1940).

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A National Roster of Scientific and Specialised Personnel, on the lines of the British Central Register of the Ministry of Labour, is being compiled in the United States with the object of developing "a means for the efficient and rapid but appropriate use of the specialised brains of America in the service of the nation."

ABSTRACTS

[TUBERCULIN REACTIONS IN CATTLE AFFECTED WITH BANG'S DISEASE. Hastings, E. S., and McCarter, J. R. (1940.) *J. Amer. vet. med. Ass.* **96.** 186.]

Holt, in Norway, observed that some cattle affected with Bang's disease but free from tuberculosis react to tuberculin. To find whether infection with *Br. abortus* sensitises any considerable number of cattle to tuberculin and is therefore partially responsible for the large number of no-visible-lesion tuberculin-reacting cattle in Wisconsin, the authors tested the sera of tuberculin-reacting cattle for agglutinins for *Br. abortus* and made tuberculin tests in cattle experimentally infected with this organism.

In the sera of 229 tuberculin-reacting cattle showing no visible lesions on *post-mortem* examination only 5·6 per cent. gave a positive agglutination test, while of 447 with generalised tuberculosis lesions, and 129 involving the skin only, 13 per cent. and 3·1 per cent. respectively reacted similarly.

When 135 pregnant animals were experimentally infected with *Br. abortus* none reacted to the tuberculin test although all either aborted or developed agglutinins in their blood before the application of the tuberculin test.

The authors conclude that these results do not support Holth's theory that cattle are sensitised to tuberculin by infection with *Br. abortus*.

S. J. E.

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[THE CAUSES OF DEATH DUE TO THE ENTRANCE OF AIR INTO THE VENOUS SYSTEM. Goret, P., and Dieng, F. (1940.) *Rec. Méd. vét.* **116.** 49.]

The many theories concerning the cause of death following the entrance of a large volume of air into the venous system are discussed together with the clinical symptoms and pathological findings. Experimental evidence is brought forward to show that death in the dog due to the intravenous injection of 40 to 160 c.c. of air is due to embolism of the pulmonary arterial trunks, whereas in the rabbit the air readily passes through the lungs to the left ventricle and death following the intravenous injection of 2 to 5 c.c. of air is due to embolism of the cerebral vessels.

H. H. S.

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[ENDOCRINOLOGY IN THE BEEHIVE. *British Medical Journal.* (1939.) Dec. 16th. p. 1195.]

It is known that only those larvae destined to become Queens receive Royal Jelly for more than two to three days of larval life. The worker bees emerge from the larval stage with infantile sex organs. Worker larvae substituted for the normal inhabitants of the Queen cells receive Royal Jelly and emerge as full-sized Queens. Extracts of Royal Jelly when tested by the usual methods for gonadotrophic activity give positive results. The jelly is produced in the supramaxillary gland of the bee which is probably homologous with the anterior pituitary.

J. F.

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Oct. 24th.—Meeting of the Lincolnshire and District Division, N.V.M.A., at Lincoln, 2 p.m.

Oct. 25th.—Annual General Meeting of the Yorkshire Division, N.V.M.A., at Leeds, 2.30 p.m.

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The Profession and Military Service

Owing to stress of work and the fact that the *Veterinary Record* went to press the day following the Council meeting, N.V.M.A., it is regretted that an incorrect copy of a note on the above subject was inserted in our issue of last week. We are accordingly publishing the corrected copy, this week, as follows :—

As reported in our issue of August 17th, the Council of the Royal College of Veterinary Surgeons, after carefully considering the question of the continued inclusion of veterinary surgeons in the schedule of reserved occupations, resolved to recommend that veterinary surgeons should remain reserved, but that a tribunal should be set up to which any member of the veterinary profession who wished to join the armed forces might appeal against reservation. This recommendation has been sent to the Ministry of Labour and is being considered in consultation with the Government Departments concerned.

In the meantime the rule holds that any person who is in a reserved occupation who becomes unemployed for a period of two months may, if he so desires, volunteer for military service.

It is the view of the Councils of the National Veterinary Medical Association and of the Royal College, however, that there is much work of vital importance to the community which veterinary surgeons can best perform but which has not yet been undertaken in connection with those animal diseases which take such a toll of our livestock—abortion, sterility, mastitis, etc. The Survey Committee of the Association is giving the most earnest and diligent study to this question, and we hope to be able to report shortly the recommendations which will be made to the Ministry of Agriculture and the Ministry of Food. In the meantime, we can only counsel veterinary surgeons to be patient awhile, and not deplete the ranks of those whose services may be called upon for the preservation of our livestock by seeking military service in a non-professional capacity—for the services which the veterinary profession can render to the community cannot be adequately supplied by any other profession.

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Facility of Movement for N.A.R.P.A.C. Personnel

For ordinary purposes the buff identity card and the car badge issued by the National A.R.P. for Animals Committee to its technical personnel is satisfactory for facilitating movement concerned with the carrying out of N.A.R.P.A.C. duties. Where there is any difficulty, however, it is quite proper for N.A.R.P.A.C. Officers to have their identification cards endorsed by the A.R.P. Controllers in the same way as do other Civil Defence workers. This will put N.A.R.P.A.C. on the same footing as Civil Defence in the eyes of such bodies as the military, etc. Special windscreen labels, approved by the Home Office, will soon be issued to A.R.P. authorities for distribution to owners of vehicles engaged on Civil Defence work. N.A.R.P.A.C. Officers are advised to make application to local authorities for screen labels so that they may be affixed to their Mobile Unit cars and Animal Ambulances.

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PERSONAL

Births.—Buckler.—On October 13th, 1940, at 34, London Road, Stevenage, Herts, to Kathleen (*née* Lonsdale), wife of G. K. Buckler, M.R.C.V.S., a daughter.

Drummond.—On October 5th, to Dorothy May (*née* Wardle), wife of J. Drummond, M.R.C.V.S., Home Farm, Byrkley, Burton-on-Trent—a daughter.

Goslin.—On October 2nd, at "Half-acre," Danbury, to Mabel (Wimp) (*née* Mulvey), wife of Reginald A. J. Goslin—a son.

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Colonial Veterinary Service Promotions.—The following promotions are announced: Mr. W. A. Allen, M.R.C.V.S., D.T.V.M. [Edin.] (Veterinary Officer), Senior Veterinary Officer, Uganda, and Mr. W. G. Emerson, M.R.C.V.S. (Senior Veterinary Officer), Deputy Director of Veterinary Services, Kenya Colony and Protectorate.

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R.C.V.S. OBITUARY

Axe, Harry J., D.S.O., Lt.-Colonel late R.A.V.C., 4, Fortescue Road, Bournemouth. Graduated London, January 4th, 1884. Died October 2nd, 1940.

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Legal Notes

STOCK-OWNER'S LOSSES FROM REFUSE-POLLUTED STREAM

Claim Against Dartmouth Corporation

Mr. H. J. Burden of Townstal Farm, Dartmouth, successfully claimed damages in a High Court action against Dartmouth Corporation for illness to stock following pollution, from a refuse heap, of a stream on his land.

The damages awarded by the official referee, Mr. S. R. C. Bosanquet, K.C., included £44 for loss of condition of stock, £40 in respect of the eleven dairy cows, £45 for a bull, £30 for a mare, £10 in respect of two heifers and £59 veterinary and analyst fees. He found that plaintiff was entitled to recover £228 1s. 6d. against the Corporation with costs, except £25 in respect of two experts, Dr. Sheather and Prof. Wooldridge, called by the defence, whose evidence had assisted him, and certain costs ordered to be the defendant's in any case. The damages awarded were somewhat less than one-third of the amount of the claim.

The Corporation, in August, 1938, commenced to fill up a disused quarry near Townstal Farm. Rubbish of all kinds, from dustbins and other sources, including fish refuse, was dumped. Mr. Burden was not affected by this, apart from the smell—which probably was not very savoury—but in October and November prolonged rains culminated in a heavy storm on November 28th. As a result the quarry became full of an exceedingly foul liquid mess.

Drainage of the quarry was carried out by syphon pipes, which discharged into a stream of clear water running on land in the occupation of the farmer. On November 27th, Mr. Burden had turned eleven milking cows and a bull into one field by the stream and a mare and two heifers into another field. He had asked the Borough Surveyor whether it was safe to do so, having regard to the foul water following the rain, and was informed it was safe.

The animals became ill and suffered from dysentery; nine cows aborted and a mare had to be destroyed.

Richard Hedley, M.R.C.V.S., of Torcross, said he inspected the quarry with the plaintiff. He noticed a stream near the gate was "black and bubbly," and that there was a considerable amount of chloride of lime about the banks. He saw sheep's lungs and windpipes—and other refuse—partly submerged in the quarry water, and he came to the conclusion that the condition of the animals was due to drinking water polluted by this material. In all, eleven cows, one bull, one mare and two yearling heifers were affected. Nine animals aborted. Other animals in fields not affected by the water were all in good condition. He examined the fodder and finding nothing wrong with it sent a sample of the water for analysis.

When it was suggested by Counsel that certain analyses proved conclusively that there was nothing whatsoever in the water injurious to cattle, Mr. Hedley replied "You are entirely wrong." Also he was certain that the illness was not caused by coccidiosis.

Mr. Hedley contended that it was quite wrong to say that it was biochemically impossible for any gas coming from putrefaction to be harmful to cattle. When he smelt and saw the water he had the animals removed from the field. No animals except those in the field were affected.

Thomas Tickle, Public Analyst, Exeter, said the sample of liquid he received from Mr. Hedley was found to be entirely unfit for cattle to drink. If it were discharged into a clean river it would render the river water unfit for cattle to drink unless the volume of the river water reached a certain state of dilution. The analysis told him that the liquid was full of foul decaying matter of much the same nature as is found in ordinary sewage: it was about four times as strong as Exeter sewage in its raw state. This sample had been received in December. A sample taken from the field and received by him at the end of January was not injurious for cattle.

Dr. G. W. Clough, Royal Veterinary College, giving evidence for the defence, contended there was nothing in Mr. Tickle's evidence to justify the inference that the liquid analysed was unfit for cattle to drink.

Charles Masson, M.R.C.V.S., of Torquay, said in January, 1939, he was requested by Dartmouth Corporation to visit the farm. "I had gone there expecting to find an awful mess. Instead I found eleven cows in as good a condition as any cows in South Devon at that time." He could only come to the conclusion that the animals had aborted because of contagious abortion and that they had never scoured. Later he took blood samples from eleven cows and the bull. He considered that most of the cows giving positive results would have aborted in any event. The mare which he saw was worn out.

Witnesses for the defence stated that no sheep's offals had been deposited in the dump.

Dr. A. L. Sheather told of reports submitted to him, also blood samples taken from cows alleged to have aborted. He expressed the view that the abortion of the cows could not possibly have been due to drinking the water from the quarry. He based that view on the fact that the organism which is responsible for contagious abortion is not one which survives for any great length of time outside the animal body, and any matter of that kind, even if it had gained access to the water, would not have survived. The disease was transmitted from animal to animal by immediate or intermediate contact. He agreed that contagious abortion was independent of the condition of an animal. Water did not necessarily set up illness simply because it was filthy and stinking; it might do so, however, if there were contagion from elsewhere.

Professor G. H. Wooldridge said that from the tests for contagious abortion of eleven cows, nine out of ten which were positive would have aborted in any event, assuming that it was the first time they had been infected. He thought the alleged diarrhoea of the cows in December, 1938, if not due to water, might be due to their being put from a dry on to a succulent pasture—a water meadow. Replying to questions regarding a sample of water, which a previous witness had considered unfit for cattle to drink, he said he found no basis for assuming that the water was unfit. On the contrary, in his opinion the bacterial content was far less than was frequently met with in ponds into which cattle waded to drink; in fact in some samples the bacterial content did not exceed that permitted in grade A milk under the old designations. He knew of no irritant poison in fish offal. He could not conceive that an irritant poison capable of causing the symptoms described would be likely to disappear from the water in a few days. He mentioned experiments in which cattle were given sewage to drink and said the cattle had not suffered at all.

His Honour held that Mr. Hedley took the right course. He had not hastily condemned the water, but did what any prudent man would do, namely, send a sample to the county analyst whose report on the face of it seemed to justify the suspicions which the veterinary surgeon and Mr. Burden had entertained.

The Corporation had brought in eminent witnesses to prove that the water sent to the county analyst was innocuous, but His Honour did not think the analyst's evidence deserved to be dismissed in that way. After all he was the County Analyst, and he justified his view by the large amount of dissolved oxygen taken up from the water, and said he would predict that animals drinking the fluid would develop certain symptoms, and they did.

His Honour did not decide which of the experts were right, but he was satisfied that when these animals drank this water on November 27th, 28th and 29th, there was something in it which caused dysentery. The various foods which had been examined were found to be all right, and on the suggestion that the cows had been moved from a dry to succulent pasture he did not think the effect would produce such sudden and violent illness.

He, therefore, found for Mr. Burden on the main question. The Court had to consider the damages from the animals having suffered in consequence of the Corporation's action. The claim in regard to contagious abortion was not made out and the plaintiff was not entitled to any damages for loss of calves for which he claimed £90.

In making his award, as above, His Honour gave effect to the value of the milk lost and the question of the continuing loss of condition in the herd.

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SECURING OF HORSES IN AIR RAIDS

A Ministry of Home Security Order provides for the securing of horses in air raids, the object being to protect the public and to prevent roads from being obstructed by vehicles dragged by frightened horses. From next Monday no horse may be on a speed-restricted road unless it is wearing a halter with a rope or ropes attached. During a raid the police may give instructions about securing a horse and the place where a vehicle should be

left; otherwise drivers must leave their vehicles so as not to obstruct the traffic and must do their best to secure their horses. Horse emergency standings indicated by placards should be used whenever possible.

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CORRESPONDENCE AFTER AIR RAID DAMAGE

Arrangements have been made to help people who have had to leave their homes temporarily or otherwise as a result of air-raid damage, or of precautionary measures taken after an air raid, to receive correspondence addressed to them at their former homes.

The Postmaster-General states that those who remain temporarily in the neighbourhood of their homes should inquire at a local Post Office as to the point at which they can obtain their correspondence. Those moved to other districts who have left their former homes unoccupied and who have not made other arrangements for the reception of their correspondence should, as soon as they have settled in more or less permanent quarters, apply at once at a Post Office for a redirection card P2216B. If they follow the instructions on the card their correspondence will be forwarded on to them at their new address. If they were on the telephone they should enter particulars of their former telephone number on the card also.

The same course should be taken by any people remaining in their original neighbourhood once they have taken up fresh quarters there on a permanent or semi-permanent basis.

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FEEDING STUFFS FOR LIVESTOCK

Farmers are now buying store cattle and sheep and making their plans for winter feeding. The Government are anxious that normal numbers of beef cattle and sheep should be kept and that they should be marketed evenly through the coming months. This marketing policy is dependent on adequate supplies of feeding stuffs.

The Agricultural Departments and the Ministry of Food state that no guarantee can be given in war-time, but every effort will be made to provide for feeders of cattle and sheep during the coming winter some 60 per cent. of the supplies of oil cake which they purchased for such stock in the winter and spring of 1938-39, and these supplies will be more evenly distributed than was possible a year ago. The quantity of cotton seed cake will be reduced, but as far as possible the deficiency will be made good by larger supplies of linseed, palm kernel and coconut cake.

With the increased supplies of home-grown grain and of fodder crops now available on farms, and with more economical feeding and the acceptance of a lower standard of finish, farmers should be able to plan their livestock production and marketing in accordance with the national requirements.

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BRITISH PERCHERONS

Members of the British Percheron Horse Society, at their annual meeting at Histon, Cambridge, elected Mrs. Q. E. Gurney, Bawdeswell Hall, Norfolk, President for the ensuing year. Mr. W. S. Mansfield, University Farm, Cambridge, was appointed President-elect. Mr. Mansfield is the Director of the Cambridge University Farms. Mr. R. C. Irving, F.R.C.V.S., was among those elected to serve as members of the Council.

The annual report showed an increase in the number of members, and the accounts gave a profit of £260 on the year's working.

It was decided to make preliminary arrangements for holding a Stallion Show with the usual extensive classification in March, 1941, at Histon, Cambridge.

CLYDESDALE BREEDING ENCOURAGEMENT

"With such a large handling to dispose of, it was not unnatural that some doubts should have been entertained amongst Clydesdale-breeders as to the probable outcome of the great autumn sale at Lanark which closed on Friday," observed the *Farming News* in its issue of October 11th. "The entry of 1,486 head was a record one, being over 400 more than last year, and, keeping in view the revolutionary happenings of the past year, with its unprecedented call for mechanical cultivation and transport, it could well have been that there might be a considerable easing down of demand and prices for Clydesdales. As business went, however, Clydesdale men are still encouraged to breed, and breed well. And, analysing the trend of business at Lanark, one cannot avoid the conviction that the better the breeding the more solid chance there will be of continuing to derive some profit from the business. A similar principle, of course, applies to all classes of livestock. It is too late in the day to expect that anything will pass muster for the production of cash. Just as work must be well done to meet the requirements of these difficult times, so failure to produce the best in the sphere of stock-breeding is throwing away money and courting disaster.

"Apart from anything else, however, it is an encouraging reflection that our great work horse breed, the Clydesdale, continues to command a well-established and necessary place in the equipment of the country in the present crisis. Admitting the great place now occupied by the purely mechanical element, which admittedly could not now be well done without, it is surely a pleasing thought that there should still be an important place for the Clydesdale, the development of which has been such an admitted credit to this country. It is a reminder to us of the verity of that old-established axiom, 'A place for everything and everything in its place.'"

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MEDICAL PERIODICALS AND THE BLOCKADE

An interesting note on the diminution of scientific publications owing to the blockade appears in a recent issue (August 24th) of the *Journal of the American Medical Association*. In normal times the library of the American Medical Association receives about 1,400 different periodicals. The most recent shipment from Germany arrived on July 22nd, when only two periodicals were received. On June 26th eight periodicals were delivered, but the last large shipment was received on May 27th. Some Austrian weekly publications which used to arrive every seven to ten days had not been received since early in June. No Polish or Czecho-Slovakian journals have arrived for many months. Within the last two months official notification has been received by the Association of the suspension of eleven French medical periodicals. From Italy the last weekly receipts were at the end of June and few Italian publications arrived since that date. The journal states that publications from Great Britain for June and July are being received with perhaps a very slight delay.—*Pharm. J.*

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WASTE OF FOOD FROM TUBERCULOUS PIG CARCASES

Lesson of a Small Borough's Experience

Forwarding the report reproduced below from the *Bilston and Willenhall Times*, a correspondent comments, "Bilston is only a small borough and contains two or three slaughterhouses dealing with pigs only. . . . If Bilston has to destroy seven tons of pork in two months what must be the loss in a large abattoir? The state of affairs disclosed by Mr. Downs really calls for action by the Ministry of Agriculture. It would be a simple matter to make an order compelling farmers or pig feeders to boil their milk or whey before feeding it. Swill has to be boiled, so why not milk?"

The report is as follows:—

"Bilston Town Council is alarmed at the amount of tuberculosis found in pigs slaughtered in the borough, and the matter was raised at a monthly meeting by Alderman J. E. Downs, who said that at the meeting of the Health Committee held on September 10th it was reported that 7 tons 9 cwts. and 88 lb. of meat had been condemned in July and August. The greater part of this was from carcases or parts of carcases of pigs affected with tuberculosis. In about 90 per cent. of the affected carcases examined, only the glands in the throat were found to be affected. In these cases the disease was localised and the head only was condemned. In his opinion the disease was caused by the pigs being fed with skim milk and whey which had not been pasteurised or boiled, and if either of those two very necessary treatments was made compulsory, a colossal waste of food and constant source of infection would end.

"He knew from practical experience the effect of diseased milk on pigs, but did not profess to know the effect it had on children, but it appeared to him that there must be the same effects. He understood from what he had read that this was the case, and he also knew the sanatoria of this country were usually fully occupied.

"While expressing his appreciation of the work done by the meat inspectors and the records they presented each month, which he understood were filed away, and the yearly report forwarded to the Minister of Health at the end of the year, he wished to recommend that the meat inspectors obtain the names and addresses of the feeders of the infected pigs' heads each day, these to be forwarded to the proper authority, so that the matter could be taken up with regard to the inspection and testing of the cattle which were producing this tuberculous milk. At present the farmer did not know of the condemned parts he was producing, as he was paid the full value for his pigs. He paid 6d. per pig insurance, and then received full value of his carcases, but did not know there was anything wrong with them.

"Alderman Downs then moved the following resolution: 'The Council request the Ministry of Health to bring to the notice of the appropriate authorities the need for the more stringent observance of the provisions of the Tuberculosis Order of 1925 in connection with the destruction of cows infected with tuberculosis, and that they also be requested to give directions that all milk used for the feeding of pigs should be boiled or sterilised before use.

"'Further, a weekly report of the amount of tuberculous pigs or part of carcases condemned be forwarded to the appropriate authorities, and in addition, with a view to ascertaining that the milk supply in the borough is free from tuberculosis, the Council recommend more frequent taking of samples of types of milk brought into the borough for sale by retail.'

"In seconding, Councillor Dr. Abbott congratulated Alderman Downs on calling attention to such a matter. First, from the food point of view. Here in a small town like Bilston they had seven tons of food destroyed, and this was a national sore in the food campaign which could easily be stamped out by the Ministry. The incidence of tuberculosis had already gone up, but it could be reduced by the measures which Alderman Downs was asking to have done.

"The resolution was carried."

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ANIMALS' REACTIONS TO AIR RAIDS

Following upon the receipt of a letter anent "the geese of the capital and their angry cackling at German raiders," the *Times*, through its Special Correspondent on zoological affairs, appealed for information as to the effects of air raids on animals. Following is the announcement of the result of the enquiry thus made of its readers:—

"So far as the London Zoo is concerned there is little to report. It is difficult to observe the animals' behaviour at night when things are really happening. After a bad night, and during such day raids as there have been, they seem unconcerned. Almost all the society's geese are at the moment at Whipsnade, so that it has not been possible to confirm the reports that geese are peculiarly alert sentinels for air raids.

"However, some very interesting reports have come in from the Maidstone Zoo. In general, the experience there has been the same as in London—the animals show no reaction to the most violent air activity or A.A. fire. On the other hand, the two chimpanzees, though they do not mind the guns, stamp and shriek at the sound of the siren. And of two emus, one is indifferent to noise, but the other gets so excited at the sound of the A.A. guns and rushes about so violently that fears are entertained for its safety.

"A cow elephant about 20 years old is so sagacious that she hurries to her house if the A.A. barrage catches her in the open, but once there does not seem to mind. Finally, one lion, normally a quiet animal, after a shell fragment hit him in his cage (doing little hurt as it ricochetted off the bars), has become conditioned to the A.A. guns, starting to rip his cage to bits every time they start firing.

"As regards wild birds, there is a good deal of evidence that many of the larger kinds are disturbed by the sound of bombs or A.A. fire. With song-birds and other passerines, however, the chief reaction seems to be to aircraft. These are treated as if they were hawks, the birds scattering downwards and crouching to avoid detection. There are two curious exceptions to this; neither robins nor any member of the swallow tribe have been seen to pay the slightest attention to aircraft. The stories of gulls giving warning of the approach of hostile aircraft are presumably based on the same reaction: their keen senses—eyes more probably than ears—detect the aeroplanes a little before they are audible or visible to human beings.

"Domestic animals vary individually. Some dogs have what may be called A.R.P. sense, and distinguish perfectly between the alert and the all-clear signals. One cat has been reported in this category; at the alert she comes indoors to take shelter, but when the raiders-passed signal is given she jumps up and scratches to be let out. She is indifferent to mere noise. Other dogs show no recognition of the difference between the sirens' signals. Again, some dogs do not mind the noise of guns and bombs, or even seem to like it, while others are miserably frightened and crawl under the furniture. Some parrots definitely dislike the noise, and scream loudly and hysterically."

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HUMAN OSTEOMALACIA: THE KNOWN FACTORS

"The decalcification of bones in human osteomalacia was long ascribed to excessive ovarian activity, and ovariotomy was performed for its relief," says the *British Medical Journal* in a recent leading article. "Scientific evidence for the theory was lacking, and new facts discovered in the last 30 years have put the pathology of the disease on a sounder basis. Osteomalacia arises from an imbalance between the utilisation and supply of calcium and vitamin D. Meulengracht[1] has recently described five groups of cases of osteomalacia—six cases in which inadequacy of diet led to deficient intake of vitamin D and calcium; eight in which achylia gastrica was thought to have caused deficient absorption; one in which defective absorption arose from pyloric stenosis after peptic ulceration; one case of 'sprue,' probably dating from coeliac disease in childhood, in which deficient absorption was attributed to formation of insoluble calcium soaps in the bowel; and two cases in which the habitual taking of purgatives (rhubarb powder in one and senna pods in the other) led to deficient absorption

(1) *Acta med. scand.* (1939.) 101. 132.

presumably because of the rapid passage of bowel contents. In another paper Meulengracht[2] described osteomalacia in a man who had taken Carlsbad salts daily over a period of 35 years; defective absorption probably arose from union of the calcium with the sulphate ions in the salts to form insoluble calcium sulphate.

"These and other causes have been studied before. Donald Hunter[3] and others have pointed out the extreme prevalence of osteomalacia in the East, especially in China and India, where the diet is almost exclusively cereal without milk, meat, or eggs. Kathleen Vaughan[4] emphasised the rôle of sunlight in the prevention of osteomalacia. Kashmir women who observe strict purdah and remain indoors suffer very frequently from the condition, while it never occurs in the Kashmir boat-women, whose bodies are exposed to the sun. Osteomalacia is common in women who live in dark, narrow streets, but rare in the better-lighted houses. Vaughan also showed that repeated pregnancies and continued lactation drain the reserves of calcium and precipitate osteomalacia. Donald Hunter[5] reported 15 cases of idiopathic steatorrhoea with skeletal changes in all—osteoporosis in twelve, and osteomalacia proved by histological examination in three. Pavlov showed that fistula of the pancreatic duct produced osteomalacia in dogs—probably through malabsorption of calcium by formation of insoluble calcium soaps—and this has since been confirmed in man. A biliary fistula has the same result, though here possibly other factors may play a part. Another interesting possibility has been raised by Ask-Upmark,[6] who describes osteomalacia in association with hepatic cirrhosis. The liver being the chief storehouse of vitamin D, liver disease may cause signs of deficient storage of the vitamin, just as it may cause hyperchromic anaemia by deficient storage of the P A factor. Gerstenberger[7] had previously recorded an analogous case of severe rickets which failed to respond to treatment in an infant with hepatic cirrhosis.

"Such are some of the known factors in the causation of osteomalacia. It would seem unnecessary to employ different names such as 'osteomalacia hepatica' (Ask-Upmark), 'achylic osteomalacia' (Meulengracht), 'senile osteomalacia,' 'hunger osteopathy,' and so forth. A variety of factors can cause deficiency of calcium and vitamin D, and deficiency of calcium and vitamin D, however produced, may lead to osteomalacia. But Meulengracht's paper points to two morals—that we should be on the look out for cases of osteomalacia, and that we should strive to prevent the condition. Almost all the cases he described had been treated for many years by physiotherapy and other means without avail. A long history of pain in the back or hips or loins (the Chinese name for the disease is "yao t'ui t'eng"—back and thigh pain), especially if it is worse on movement, should make us examine the back for deformity and apparent shortening in the neck or lumbar region. We should look for the transverse folds of skin and the narrowing of the space between the costal margin and the iliac crest, which Meulengracht describes as so characteristic, and an X-ray film of the spine should be taken in case of doubt. Our chief aim, however, should be to prevent the disease. The diet in Denmark, India, and the East is seriously deficient in vitamin D and calcium, and Sir John Orr[8] states that the diet of a very large section of the English community is likewise defective. Osteomalacia (so-called hunger osteopathy) was very prevalent in Germany and Austria after the last war, and it may well recur in and after the present war. We in England at least can do something to prevent the disease by ensuring that the population has an adequate balanced diet and so benefits from the knowledge we have obtained."

(2) *Lancet.* (1938.) 2. 774.
(3) *Brit. J. Surg.* (1931.) 19. 203.
(4) *British Medical Journal.* (1926.) 1. 413.
(5) *Quart. J. Med.* (1932.) 1. 603.
(6) *Acta med. scand.* (1939.) 99. 204.
(7) *Mschr. Kinderheilk.* (1937.) 56. 217.
(8) *Food, Health and Income.* (1937.) London, Macmillan.

FAT

"To the physiologist," observes the *British Medical Journal*, "fat is a normal constituent of living matter, animal and vegetable, playing a minor physical part in the structure of the organism and a major part as fuel. He knows, or believes, that its combustion is dependent on an adequate intake of carbohydrate and has been taught that it can be synthesised from carbohydrate itself. To the chemist, on the other hand, fat is a mixture of esters, compounds of glycerol, and fatty acids, predominantly stearic, palmitic and oleic. Apart from the so-called analytical values—used by the analyst for purposes of identification and detection of adulteration—the chemist has concerned himself with working out the detailed structures of the various acids and with practical and theoretical problems arising out of such phenomena as rancidity and 'tallowness' of natural fats. The biochemist, however, is apt to be rather unjustly impatient with his colleagues in the two adjacent sciences. Hardly going so far as to wish a plague on both their houses, he suspects the physiologist of an undue leaning towards a vitalistic or teleological outlook and an insufficient regard for the fundamental chemical changes taking place during intercellular fat metabolism; and the chemist he inclines to find guilty of taking a too static view of naturally occurring substances, of regarding fats as the contents of barrels and jars instead of as integral parts of living cells. It is perhaps, therefore, a wholesome corrective to the biochemist's tendency to self-righteousness that Professor Hilditch should have made abundantly clear in his imposing and authoritative monograph* just what it is that chemistry—relatively 'pure' chemistry—has to contribute to the biochemist's vital problems. The bulk of this important book is occupied with descriptive matter relating to the actual triglyceride make-up of every economically important fat and of many others of less direct industrial interest, yet the conclusions to be drawn from the work as a whole are of the greatest biochemical importance. Professor Hilditch discusses the light that glyceride structure throws on a host of problems near to the hearts of physiologist and nutritionist. He has taken cognizance of the work in which Frazer and Stewart seem to show conclusively that part at any rate of ingested fats do not undergo lipolysis, difficult though this view is to reconcile with the results of the Verzar school. He discusses the suggested courses of β-oxidation, ω-oxidation, and multiple alternate oxidation, but wisely refrains from judging between the different views. Profoundly interesting are some of the generalisations that Professor Hilditch has been able to base on the twenty or more years of research by himself and his colleagues, of which this work is in every way a worthy record. Natural fats may to a large extent be classified according to their major component acids, and . . . such a grouping follows fairly closely that already developed from biological considerations. . . .' 'As biological development has proceeded, the chief component acids of the fats of the higher organisms have become fewer in number.' 'Nature strongly favours the elaboration of "mixed," and not simple, triglycerides.' 'The fatty acids are distributed evenly or indiscriminately through the triglyceride molecules, so that (because of the large number of different fatty acids present) very many of these contain three different acyl groups.' This is designated by Professor Hilditch as 'the rule of even distribution.' 'There seem to be good reasons for the belief that fats are manufactured from carbohydrate, etc., in one central site of the animal body, probably the liver.' Referring again to the biosynthesis of fats, the author observes shrewdly that, of the many hypotheses put forward, relatively few of them 'have accorded sufficient weight to consideration of the different characteristic groups of component acids which are known to be representative of various natural biological groups of fats.'"

**The Chemical Constitution of Natural Fats.* By T. P. Hilditch, D.Sc., F.I.C. Chapman and Hall, Ltd. (35s.)

THE BLOOD CELLS' FAMILY TREE

"One of the most vigorous disputes in the realm of pathology during the last 40 years has centred round the exact relationships of the blood cells," writes the *Lancet* in a recent issue, and continues: "Now unhappily the fiercest protagonists of the two conflicting faiths are dead. To describe their views as faiths is not inappropriate. Dualists were led by Naegeli, unitarians by Maximow, and each side denied the validity of the evidence of the other. Maximow constructed a family tree more complicated than any human one based in great part on his belief in the identity of myeloblasts and lymphoblasts. Naegeli warned the world against so retrograde a view. According to dualist teaching myeloblasts, the primitive parent cells of the marrow, can breed marrow cells only; the lymphoblasts of lymphoid tissue lymphocytes only. The implications of the unitarian view are that parent cells are identical; the nature of the progeny depends on where the parents are and on local physiological or pathological conditions.

"The reason why such an apparently simple dispute has remained so long unsettled is technical. It is seldom possible to follow by direct observation successive stages in the development of either type of cell. A large number of devices have been employed to get round this difficulty, but almost all have required the piecing together of isolated observations of different cells. The latest of these is an improved technique for the culture of marrow cells described by Israëls.[1] Starting with marrow containing a majority of granulocytes, lymphocytes or monocytes derived from patients with myeloid, lymphoid or monocytic leukaemia, he determined the nature of the majority of cells after 14 days in the culture. He concludes that, under the conditions of his experiments, granulocytes, lymphocytes and monocytes follow three distinct lines of development with no intermediate forms. His interpretation of these experiments is rightly limited, for the cells were pathological—an old-standing objection to much of Naegeli's work—and the conditions were not made to vary.

"The haematologist's problem is not so much what these cells usually do as to what they are capable of doing. We know that in marrow the haemocytoblast usually produces marrow cells and that in lymph-glands lymphoblasts usually produce lymphocytes. It is known too that when conditions vary, as they do in disease, lymphocytes may predominate in the marrow and granulocytes in situations where it is hard to account for them, suppuration being excluded. Lymphatic leukaemia is an example of the first, Hodgkin's disease of the second condition. The point that in fact requires study is the experimental variation of conditions of growth and nourishment of the parent cell or cells. Much has already been done, by Werzberg,[2] Lang,[3] Bloom[4] and others, to note and seek for stimuli which yield progeny different from the usual ones. It seems that only by varying conditions of life can potentialities be discerned and the identity or divergence of parent cells be discovered. But the time has arrived when improved technique such as the Sandison-Clark method of tissue culture in living animals[5] will probably speedily settle these old disputes."

(1) ISRAELS, M. C. G. *J. Path. Bact.*, January, 1940, p. 145.
(2) WERZBERG, A. *Virchows Arch.* (1911.) **204**. 272.
(3) F. J. LANG. *Folia haemat., Lpz.* (1930-31.) **43**. 95.
(4) BLOOM, W. *Anat. Rec.* (1937.) **69**. 99.
(5) See *Lancet*. (1939.) 2. 939.

* * * * *

EXPERIMENTS ON SOIL FERTILITY

"The growing of plants without soil, which was discussed in these columns on June 1st, seems to have demonstrated that vegetables of normal quality and dietetic value can be produced by supplying the plant solely with inorganic salts in watery solution," states the *Lancet* (June 22nd), which continues: "Yet the belief that vegetables grown on a 'fertile' soil are more nutritious than those grown on a poor soil supplied with artificial fertilisers is firmly held by one school of medical and agricultural opinion. The experiments of Sir Robert McCarrison in India, when he fed rats with the diets of different peoples, have been widely adduced as proving the importance of a diet rich in fresh plant products grown on soils of high fertility. According to this view the difference lies in the absorption by the plant roots of organic substances, as yet unspecified, derived from the organic material in the soil or from the mycorrhiza shown to be associated with root systems on such soils. Some support for these views has lately come from New Zealand,* where all the farms are manured by chemical fertilisers. In 1936 Dr. G. B. Chapman, of the Physical and Mental Welfare Society of New Zealand, persuaded the authorities of a boys' school hostel to grow their fruit and vegetables on soils treated with humus. This has since been done, and a striking improvement is reported in general health and physique, particularly as regards freedom from infections, alimentary upsets and dental caries.

A brave attempt to decide this question is being made by Lady Eve Balfour, the moving spirit in the formation of the Haughley Research Farms experiment. An area of 236 acres in Suffolk has been acquired by the trustees and is to be divided into two approximately equal units. Each unit will be farmed in as nearly identical a way as possible, except in the matter of manuring. One unit will be treated with complete dressings of artificial fertilisers, organic matter being supplied only by ploughing in green crops. The other will receive only humus, manufactured from the waste products of both farms by the Indore process of Sir Albert Howard. As far as possible the crops on each unit will be grown from seed raised on that unit, and the stock on each fed from the produce of that unit. If the experiment confirms the superiority of the humus unit an attempt will be made to carry the experiment into the human field, selected families being chosen who are willing to submit themselves to feeding tests with the produce, vegetable and animal, from the two units.

Whatever its result, it is doubtful whether this experiment can give an unequivocal answer to the problem set. It is claimed that the only difference between the two units will be in the manuring and by implication therefore in the nutrition of the plants grown. But the crux of the matter lies in the plants' water-balance. In a 'fertile' soil the colloidal organic material—humus or whatever it may be—has great water-holding capacity, and plants grown in such soils can derive that steady supply which they so vitally need. On a 'poor' soil it is water-deficiency as much as nutrient-deficiency that limits growth and destroys quality. Herein lies the explanation of the success in growing plants in a nutrient solution; the water supply is under control. Unless, therefore, in the Haughley experiment some means can be employed to ensure that the water supply to the plants is equal and adequate in both units the results must be inconclusive. Nor is such an elaborate experiment essential. An early and convincing answer to the problem could be obtained if vegetables were grown by the sub-irrigation soilless cultivation method and others on a 'fertile' soil and controlled feeding experiments were conducted on rats with the produce."

*See *Nature*, June 8th, 1940, p. 905.

* * * * *

The Medical Register (Temporary Registration) Order, 1940 (S.R. and O., No. 1661), issued on September 14th under the Defence Regulations, enables the General Medical Council to register Canadian and United States doctors for the period of the emergency. The object of the Order is to facilitate the employment of doctors from Canada and the United States in the Emergency Medical Service.

INHIBITION OF LACTATION

An annotation in a recent issue of the *Lancet* stated that it is now established that lactation is initiated and maintained by a lactogenic hormone, or hormones, secreted by the anterior lobe of the pituitary and acting only on the mammary gland that has been brought to full development by the action of the ovarian hormones. "The secretion of the various hormones of the anterior pituitary is partly dependent on the level of oestrogenic hormones within the body, and is inhibited either by a natural increase in this level or by the administration of large doses of oestradiol benzoate. These observations have been successfully made use of in suppressing lactation during the puerperium by intramuscular injections of large doses of oestradiol benzoate. The disadvantage of this method is that it often causes after-pains and increased uterine blood-flow. Foss and Phillips[1], however, have reported that lactation may be suppressed by small doses of oestrone by mouth and that there are then none of these unpleasant side-effects. They point out that the doses used are too small to have any inhibitory effect on the anterior pituitary, and consequently conclude that in suppressing lactation oestrone may act specificially on the mammary gland by inhibiting the action of the lactogenic hormone.

Testosterone propionate in sufficient dosage also inhibits the function of the anterior pituitary, and on this account two groups of American workers have used it to inhibit lactation in women during the puerperium. Birnberg, Kurzrok and Klor[2] treated 56 patients with varying doses and at different stages after delivery, and obtained favourable results in 49. The results were uniformly good with a total dose of 125 or 150 mg. given in divided doses of 25 to 50 mg. intramuscularly at twelve-hour intervals. Lactation, engorgement and pains in the breasts did not recur after treatment was stopped. Single doses of 100 mg. and 125 mg. were generally ineffective regardless of the time of administration. Siegler and Silverstein similarly treated 50 patients with total doses of testosterone propionate varying from 25 mg. to 125 mg. given in three or five divided doses every twelve hours. They obtained successful results in 47 patients. Pain in the breasts was the first symptom to disappear eight to twelve hours after the last injection, and cessation of lactation and complete involution of the breasts occurred as early as the second day after treatment was stopped. There were no after-pains and no interference with postpartum bleeding. As little as three 10 mg. doses appeared to be quite as effective as larger doses. This appears to be a useful and inexpensive method of inhibiting lactation."

(1) Foss, G. L., and Phillips, P. *Brit. med. J.* (1938.) 2. 887.
(2) Birnberg, C. H., Kurzrok, L., and Klor, S. J. *Amer. J. Obstet. Gynec.* January, 1940, p. 107.

CORRESPONDENCE

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

* * * * *

TREATMENT OF STRAINED TENDONS

To the Editor of the Veterinary Record

Sir,—The criticism passed by Mr. Irving on Dr. Fraser's account of his experiences on firing for strained tendons will cause some controversy amongst veterinary surgeons as well as owners, trainers and hunter owners who chance to read it. Dr. Fraser's account of his procedure is very interesting, as is the way in which he has followed up his results. I differ only in the concentration of the anaesthetic. I find that a 10 per cent. solution of cocaine, giving about 1 c.c. both inside and out immediately below the knee, keeps the most sensitive of animals quiet during the operation. In some legs bulky injections cause a good deal of oedema and swelling and interfere with the correct depth and regularity of the lines. I have not experienced, following firing, any of the troubles such as pneumonia, tetanus, etc., mentioned by Mr. Irving. Certainly I have had sloughing and many a time had horses get at their legs, and perhaps been blemished, but I never remember having to kill one.

Strained tendons and bowed tendons, as described by both Dr. Fraser and Mr. Irving, embrace varied conditions in a horse's leg. It is often extremely difficult to tell exactly all that is implicated in thick legs, with suspensory, sesamoids and all the ligaments around the fetlock joint. Mr. Irving tells of twelve vanners all with the tendons of both fore legs strained. Can such lameness be compared to that of the young thoroughbred that ruptures a tendon in a steeplechase? It would be interesting to know if the laming of the twelve vanners was a gradual, or a sudden, process: seeing that both fore legs were sprained, it almost looks, to an outsider, like a gradual process. If this were so, then it would seem that either the animals were too hard worked or not up to their work, and that rest was the only temporary cure.

I consider that the lives and the usefulness of many horses have been extended by the use of the firing iron. Otherwise why should owners be so keen to have it done? I find, in fact, that they are too keen: they will not wait until the heat gets out of the parts. I have known dealers who will buy a horse readily if he has a curb and has been fired, whereas if he has not been fired the dealer will not look at him.

I do not agree that castration makes a horse grow. Horses should be done as yearlings if no use as sires. Even trainers will tell you that stallions are a nuisance. Of course many owners have the idea that if they are too slow for racing they may make hunter sires. In the driving days I used to prefer buying cast-off polo ponies and slow racehorses; the majority made good trappers and it was surprising how their legs improved even when the tendons were bowed and strained, when put to more regular and less strenuous work.

Yours faithfully,
Wm. A. Campbell.

Boroughbridge,
Yorks.
October 12th, 1940.

* * * * *

EFFECTS OF TRACER BULLETS ON CARCASES

To the Editor of the Veterinary Record

Sir,—I was at a National A.R.P. for Animals Committee meeting a short time ago when one of the speakers referred to the danger of food poisoning arising from the consumption of the flesh of food animals which have been killed or hit with tracer bullets because of the phosphorus which the bullet was supposed to contain.

To settle the dispute I made enquiry of our County Analyst who, in turn, wrote to Professor Drummond, the Scientific Adviser to the Ministry of Food. The following is the answer:—

"I have made some enquiries from the experts of the Ministry of Home Security and they are of the opinion that no danger is to be anticipated from the effects of tracer bullets on carcases.

"A simple precaution would be to cut away the portion of the flesh round the path of the bullet, but it seems unlikely that there will be any real danger of poisoning occurring."

Yours faithfully,
G. C. Lancaster.

Eastwick House,
Evesham,
Worcs.

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Factors in Canine Nutrition

[No. 42]

Vitamin E—Continued

Recent experimental work has revealed further facts about vitamin E deficiency in dogs. It has been shown that if weanling puppies are fed on commercial evaporated milk plus cod liver oil and mineral salts, no abnormal symptoms develop until the females are under the added strain of gestation and lactation. Of two litters of 3 and 2 pups born to a bitch fed in this manner, one puppy died within a few hours. The remainder developed acute muscular dystrophy of the legs, with general lack of muscle tonus, hyper-sensitivity to pain, and characteristic abnormal skin conditions. While nursing the second litter, the mother also showed symptoms of vitamin E deficiency.

Administration of vitamin E after development of mild symptoms effected a cure; administration after development of acute muscular dystrophy effected a partial cure. It appears that milk contains enough vitamin E for the growing period, but not for bitches under extra strain. An E deficient bitch retains as much E for herself as she can, so that her puppies develop worse symptoms. This is an added reason for the inclusion of ADMIN in a dog's diet.

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